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(71) Applicant *(for all designated States except US)*: SONERA OY [FI/FI]; Sturenkatu 16, FIN–00510 Helsinki (FI).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: HUOPANIEMI, Juho [FI/FI]; (FI). GRÖHN, Tuomo [FI/FI]; (FI). VORMISTO, Jari [FI/FI]; Sonera Oy, Sturenkatu 16, FIN–00510 Helsinki (FI).

(74) Agent: PAPULA REIN LAHTELA OY; Fredrikinkatu 61 A, P.O. Box 981, FIN–00101 Helsinki (FI).

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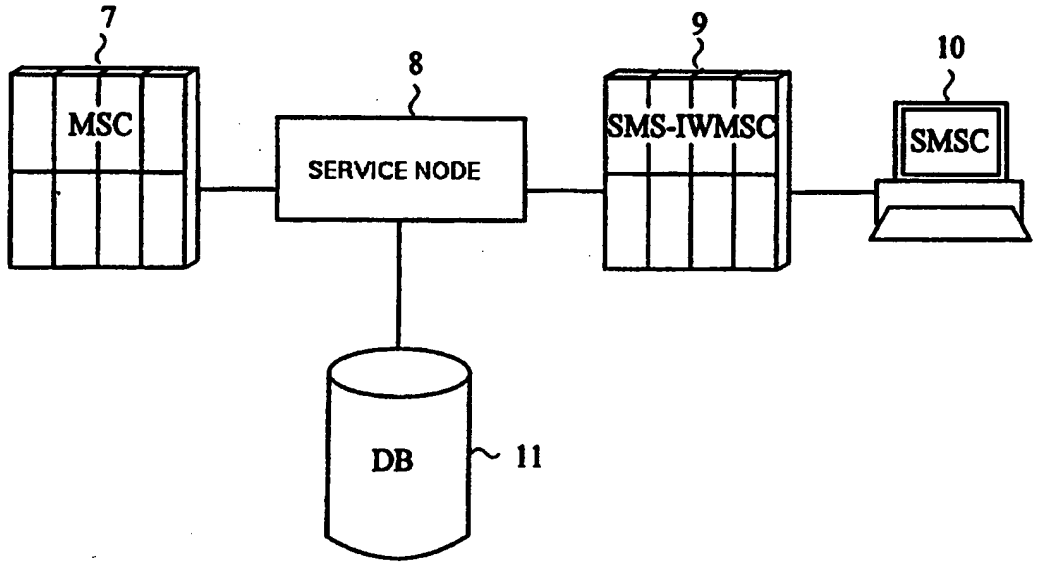

(57) Abstract

The present invention relates to a system for directing a short message to a virtual subscriber number. Moreover, the invention relates to a system for directing a short message to a subscriber–specific VPN subscriber number (Virtual Private Network, VPN). Furthermore, the invention relates to a procedure for directing a short message to a virtual subscriber number. The invention also relates to a procedure for directing a short message to a subscriber–specific VPN subscriber number.

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SYSTEM AND PROCEDURE FOR DIRECTING A SHORT MESSAGE

The present invention relates to a system and a procedure for directing a short message to a virtual subscriber number in a telecommunication network comprising a mobile communication network. The invention also relates to a system and a procedure for directing a short message to a customer-specific VPN subscriber number (Virtual Private Network, VPN) in a telecommunication network comprising a mobile communication network.

PRIOR ART

In the GSM system, the subscriber can send and receive short messages in text form. In addition, various intelligent network services have been introduced in the GSM system which allow a call to be directed to virtual numbers in the telecommunication network. One of such services is virtual subscriber number. Calls made to such a number are directed to the subscriber's actual number. Examples of this service are free numbers beginning with 0800 and national call numbers of enterprises. In the Virtual Private Network (VPN) service, individual subscribers are so grouped that the network looks like a private branch exchange to the subscriber. Calls can therefore be made from a mobile station to another mobile station or to an ordinary telephone connected to a branch exchange by using only extension numbers. Although the above-mentioned intelligent network services have been introduced, it has only been possible to utilise them in conjunction with calls. It has not been possible to send short messages to users of intelligent network services utilising virtual numbers.

The object of the present invention is to eliminate the drawbacks described above. A specific object of the invention is to disclose a new type of system and procedure that make it possible to direct short messages to virtual subscriber numbers.

A further object of the invention is to disclose a new type of system and procedure for directing short messages to a customer-specific VPN subscriber number.

In short, the object of the invention is to enable short messages to be sent to users of intelligent network services utilising virtual numbers.

As for the features characteristic of the present invention, reference is made to the claims.

BRIEF SUMMARY OF THE INVENTION

The system of the present invention for directing a short message to a virtual subscriber number in a telecommunication network comprising a mobile communication network, e.g. a GSM network, which comprises a short-message service centre (SMSC) for the reception, storage and transmission of short messages, a routing centre for the routing of short messages from the short-message service centre to the mobile station (Short Message Service Gateway services Switching Centre, SMS-GMSC), a home location register (HLR) for maintaining subscriber information, a service database (DB) for maintaining subscriber-specific intelligent network service data and a mobile services switching centre (MSC) serving the B-subscriber, comprises a service node implemented in the telecommunication network. It may be implemented as a unit separate from the short-message service centre (SMSC) or it may be implemented as a part of the software structure of the short-message service centre. The essential point is not the form of implementation but the functionality accomplished by the service node.

The services of this service node are utilised in establishing the international subscriber number corresponding to a virtual subscriber number (Mobile Station Integrated Services Digital Network, MSISDN).

In an embodiment of the system, the home location register (HLR) and the routing centre (SMS-GMSC) are connected to each other via the service node so that the service node is transparent both to the home location register (HLR) and the routing centre (SMS-GMSC). Moreover, the service node is connected to an internal or external service database (DB).

In an embodiment of the system, the routing centre (SMS-GMSC) comprises means for performing a GT analysis (Global Title, GT) on a virtual number direction, enabling the routing centre to route short messages sent in a given number direction to the service node.

The system of the present invention for directing a short message to a subscriber-specific VPN subscriber number in a telecommunication network comprising a mobile communication network, e.g. a GSM network, which comprises a mobile services switching centre (MSC) serving the A-subscriber, a routing centre for routing short messages from the mobile station to the short-message service centre (Short Message InterWorking Mobile Services Switching Centre, SMS-IWMSC), a short-message service centre (SMSC) for the reception, storage and transmission of short messages and a service database (DB) for maintaining subscriber-specific intelligent network service data, comprises a service node implemented in the telecommunication network. It may be implemented as a unit separate from the short-message service centre (SMSC) or it may be implemented as a part of the software structure of the short-message service centre. The essential point is not the form of implementation but the functionality accomplished by the service node. The services of this service node are utilised for establishing the international subscriber number corresponding to a virtual subscriber number (Mobile Station Integrated Services Digital Network, MSISDN).

In an embodiment of the system, the mobile services switching centre (MSC) and the routing centre (SMS-IWMSC) are interconnected via the service node so that the service node is transparent both to the mobile services switching centre (MSC) and to the routing centre (SMS-GMSC). In addition, the service node is connected to an internal or external service database (DB).

In an embodiment of the system, the mobile services switching centre (MSC) comprises means for performing a GT analysis on the number of the service node, enabling the routing centre to route short messages sent in a given number direction to the service node.

In the procedure of the invention for directing a short message to a virtual subscriber number in a telecommunication network comprising a mobile communication network, which comprises a short-message service centre (SMSC) for the reception, storage and transmission of short messages, a routing centre (SMS-GMSC) for the routing of short messages in the direction short-message service centre - mobile station (SMS-GMSC), a mobile services switching centre (MSC) serving the B-subscriber, a service database (DB) for maintaining intelligent network service data and a home location register (HLR) for maintaining subscriber information, to which telecommunication network is connected a service node for establishing the international subscriber number (MSISDN) corresponding to a virtual subscriber number, a short message addressed to the virtual subscriber number is sent from the short-message service centre (SMSC) to the routing centre (SMS-GMSC).

From the routing centre (SMS-GMSC), a routing inquiry with the B-subscriber's virtual subscriber number as a parameter is sent to the service node. Next, the service node sends to the service database (DB) a service inquiry with the B-subscriber's virtual subscriber number as a parameter, which is answered by sending the B-subscriber's international subscriber num-

ber (MSISDN) from the service database to the service node. Next, the service node sends to the home location register (HLR) a service inquiry with the B-subscriber's international subscriber number (MSISDN) as a parameter. In response to this, the home location register (HLR) sends to the service node the B-subscriber's international mobile subscriber identity (IMSI) code and the address of the mobile services switching centre (MSC) serving the B-subscriber, and this information is transmitted from the service node to the routing centre (SMS-GMSC).

After this, the short message is transmitted from the routing centre (SMS-GMSC) to the mobile services switching centre (MSC) serving the B-subscriber. From the mobile services switching centre (MSC) serving the B-subscriber, an acknowledgement of receipt of the short message is then sent to the routing centre (SMS-GMSC), and from the routing centre (SMS-GMSC) a message indicating successful/unsuccessful transmission is sent to the service node. This message is further transmitted to the home location register (HLR), and the home location register (HLR) responds by sending to the service node an acknowledgement, which is further transmitted to the routing centre (SMS-GMSC) after the global title (GT) has been converted in the service node into the address of the routing centre (SMS-GMSC).

In an embodiment of the procedure, an error message is sent from the service node to the routing centre (SMS-GMSC) if no international subscriber number (MSISDN) corresponding to the virtual subscriber number can be found in the service database.

In an embodiment of the procedure, the error message received from the home location register (HLR) is transmitted from the service node to the routing centre (SMS-GMSC), whose acknowledgement of the error message is transmitted to the home location register (HLR)

if the service inquiry sent by the service node to the home location register is unsuccessful.

In an embodiment of the procedure, communication between the service node and the home location register (HLR) and between the service node and the routing centre (SMS-GMSC) is accomplished using standard MAP (Mobile Application Part) protocols.

In an embodiment of the procedure, communication between the service node and the external service database (DB) is accomplished using database queries of standard intelligent network protocols, such as ETSI CoreINAP, ITU-T CS1 and/or X.500 (European Telecommunications Standards Institute, ETSI, Intelligent Network Application Part, INAP, International Telecommunication Union -Telecommunications sector, ITU-T, Capability Set 1, CS1).

In an embodiment of the procedure, the mobile communication network is GSM compatible.

In the procedure of the present invention for directing a short message to a subscriber-specific VPN subscriber number in a telecommunication network comprising a mobile communication network, which comprises a mobile services switching centre (MSC) serving the A-subscriber, a routing centre for routing short messages in the direction mobile station - short-message service centre - (SMS-IWMSC), a short-message service centre (SMSC) for the reception, storage and transmission of short messages and a service database (DB) for maintaining intelligent network service data, and to which is connected a service node for establishing the international subscriber number (MSISDN) corresponding to the subscriber-specific VPN subscriber number, a short message addressed to a subscriber-specific VPN subscriber number is transmitted from the mobile services switching centre (MSC) to the service node. In addition, the A-subscriber has replaced the address of the short-message

service centre (SMSC) with the address of the service node in the address field of his/her terminal device.

Next, a service inquiry containing the A-subscriber's international subscriber number (MSISDN) and the B-subscriber's customer-specific VPN subscriber number as parameters is sent from the service node to the service database (DB). In response, the B-subscriber's international subscriber number (MSISDN) is sent from the service database (DB) to the service node. Next, the address field parameters of the short message are changed in the service node in such manner that the B-subscriber's customer-specific VPN subscriber number is replaced with the B-subscriber's international subscriber number (MSISDN) and the address of the service node is replaced with the address of the short-message service centre (SMSC).

After this, the short message is transmitted from the service node to the routing centre (SMS-IWMSC). An acknowledgement of receipt of the short message is then sent from the routing centre (SMS-IWMSC) to the service node, and the acknowledgement is transmitted further to the mobile services switching centre (MSC) after the global title (GT) has been converted into the address of the mobile services switching centre (MSC).

In an embodiment of the procedure, the address field parameters of the short message are changed in the service node in such manner that the address of the service node is replaced with the address of a default short-message service centre (SMSC), whereupon the short message is transmitted from the service node to the routing centre (SMS-IWMSC), whereupon an acknowledgement is sent from the routing centre (SMS-IWMSC) to the service node, which acknowledgement is transmitted to the mobile services switching centre (MSC) if the B-subscriber's international subscriber number (MSISDN) is not found in the service database.

In an embodiment of the procedure, the address field parameters of the short message are changed in the service node in such manner that the address of the service node is replaced with the address of a default short-message service centre (SMSC), whereupon the message is transmitted from the service node to the routing centre (SMS-IWMSC), whereupon an acknowledgement is sent from the routing centre (SMS-IWMSC) to the service node, which acknowledgement is transmitted to the mobile services switching centre (MSC) if a message addressed to an international subscriber number (MSISDN) has been sent to the service node.

As compared with prior art, the present invention provides the advantage that it makes it possible to send short messages to users of intelligent network services who utilise virtual numbers, which has not been possible before. In the system and procedure for directing a message to a virtual subscriber number, short messages can be sent by all users of the short-message service. A further advantage is that, from the user's point of view, there is no difference between virtual subscriber numbers and normal MSISDN numbers. On the other hand, the system and procedure for directing a message to a subscriber-specific VPN subscriber number make it possible to provide a short message service supporting the intelligent network VPN service, thus allowing short messages to be sent to an extension number consistent with the VPN service. A further advantage of the invention is that it allows an independence of the supplier of the short-message service centre (SMSC) because the service node is implemented as a unit separate from the short-message service centre (SMSC). Moreover, a short message sent by the method of the invention can be answered by using a REPLY function.

LIST OF ILLUSTRATIONS

In the following, the invention will be described by the aid of a few examples of its embodiments by referring to the attached drawing, wherein

Fig. 1 presents a physical configuration for a system according to the invention for directing a short message to a virtual subscriber number;

Fig. 2a and 2b illustrate the signalling in a procedure according to the invention for directing a short message to a virtual subscriber number;

Fig. 3 presents a physical configuration for a system according to the invention for directing a short message to a subscriber-specific VPN subscriber number;

Fig. 4a, 4b and 4c illustrate the signalling in a procedure according to the invention for directing a short message to a subscriber-specific VPN subscriber number.

DETAILED DESCRIPTION

Fig. 1 presents an example of a physical configuration for a system for directing a short message to a virtual subscriber number in a telecommunication network comprising a mobile communication network, such as a GSM network. The short-message service centre 1, known in itself, takes care of receiving short messages from the sender, delivering them further to the receiver and storing them until they are successfully transmitted. The routing centre 2, also known in itself, takes care of routing the short messages from the short-message service centre 1 to the B-subscriber. A new type of routing centre 2 function provided by the invention is performing a GT analysis on a virtual number direction. The mobile services switching centre 3 is in itself a known mobile services switching centre serving the B-subscriber. The home location register 6 is in itself a known home location register and it stores the subscriber information for the B-subscriber. A completely

new type of element provided by the present invention is the service node 4. By utilising the services provided by the service node, it is possible to direct short messages e.g. to national call numbers of enterprises. The home location register 6 and the routing centre 2 are so connected via the service node 4 that the service node 4 is transparent both to the home location register 6 and to the routing centre 2, in other words, the service node 4 is seen by the routing centre 2 as the home location register 6 and by the home location register 6 as the routing centre 2. The action of the service node 4 is not visible to the user's terminal device. The database 5 is used to store subscriber-specific intelligent network service data. It may be either an external intelligent network service database known in itself or it may be integrated with the service node 4.

Fig. 2a presents a signalling example for a procedure for directing a short message to a virtual subscriber number in a case where the transmission of a short message is successful. The short message has been received at the routing centre 2, which, based on the virtual number of the receiver of the short message, finds the address of the service node 4 representing the home location register 6. From the routing centre 2, a SEND_ROUTING_INFO_FOR_SHORT_MESSAGE routing inquiry consistent with the MAP protocol is sent to the service node 4. The routing inquiry carries the following parameters

Parameter	Description
Invoke Id	Identifier of the MAP service primitive
MSISDN	Receiver's virtual number
SM-RP-PRI	Parameter indicating whether transmission of the short message to the receiver is to be attempted even if the home location register has other short messages waiting
SC Address	Address of the short-message service centre

Next, a database query based on the MSISDN parameter of the SEND_ROUTING_INFO_FOR_SHORT_MESSAGE message is sent from the service node 4 to the service database 5. If the number is not found in the database 5, then the service node 4 responds with a SEND_ROUTING_INFO_FOR_SHORT_MESSAGE_ACK message containing an "Unknown Subscriber" error message in its User Error field. Otherwise, the B-subscriber's actual international subscriber number (MSISDN) is returned from the database 5.

Based on the actual international subscriber number (MSISDN), the service node 4 gets the address of the B-subscriber's home location register 6 and sends it a SEND_ROUTING_INFO_FOR_SHORT_MESSAGE query. In its SEND_ROUTING_INFO_FOR_SHORT_MESSAGE_ACK response, the home location register returns the following information:

Parameter	Description	Use
Invoke Id	Identifier of the MAP service primitive	Obligatory
IMSI	Code identifying the subscriber	Conditional
MSC Number	Address of the mobile services switching centre	Conditional
LMSI	Local (temporary) code identifying the subscriber	Conditional
User error	Cause of a user-related error reactor	
Provider error	Cause of a system error	Optional

The SEND_ROUTING_INFO_FOR_SHORT_MESSAGE_ACK message is transmitted unchanged from the service node 4 to the routing centre 2. The routing centre 2 sends the short message further to the mobile services switching centre 3, which acknowledges receipt of the same.

The routing centre 2 sends a REPORT_SM_DELIVERY_STATUS message to the service node 4, which transmits it further to the home location register 6. The message carries the following parameters

Parameter	Description
Invoke Id	Identifier of the MAP service primitive
MSISDN	Subscriber's virtual number
Service Center Address	Number of the short-message service centre
SM Delivery Outcome	Outcome of the transmission

The SM Delivery Outcome parameter has one of the following values: Absent Subscriber, MS Memory Capacity Exceeded or Successful Transfer. The home location register 6 sends a REPORT_SM_DELIVERY_STATUS_ACK acknowledgement message, which is transmitted to the routing centre 2. At the same time, the service node changes the GT address into the address of the routing centre 2.

Fig. 2b presents a signalling example for the method for directing a short message to a virtual subscriber number in a case where the query sent from the service node 4 to the home location register 6 is unsuccessful. In this case, the service node transmits an INFORM_SC message consistent with the MAP protocol to the routing centre 2 and sends the acknowledgement returned by the routing centre 2 back to the home location register 6. The INFORM_SC message contains the following parameters

Parameter	Description
Invoke Id	Identifier of the MAP service primitive
MSISDN-Alert	Indicates the subscriber of the short-message service centre

MWD Status	Indicates short-message service centres having messages to send to the subscriber

Fig. 3 presents an example of a physical configuration for a system for directing a short message to a subscriber-specific VPN subscriber number in a telecommunication network comprising a mobile communication network, such as a GSM network. The mobile services switching centre 7 is in itself a known mobile services switching centre serving the A-subscriber. As a new type of function provided by the invention, the mobile services switching centre 7 performs a GT analysis on the number of the service node 8. The routing centre 9, also known in itself, takes care of routing short messages from the A-subscriber to the short-message service centre 10. The short-message service centre 10, known in itself, takes care of receiving short messages from the sender, delivering them to the receiver and storing them until successfully transmitted. A completely new type of element provided by the present invention is the service node 8. By utilising the services provided by the service node, it is possible to direct short messages to intelligent network VPN numbers. The mobile services switching centre 7 and the routing centre 9 are so connected via the service node 8 that the service node 8 is transparent both to the mobile services switching centre 7 and to the routing centre 9, in other words, the service node 8 is seen by the routing centre 9 as the mobile services switching centre 7 and by the mobile services switching centre 7 as the routing centre 9. The user's terminal device sees the service node 8 as the short-message service centre 10. The database 11 is used to store subscriber-specific intelligent network service data. It may be either an external intelligent network service database known in itself or it may be integrated with the service node 8.

Fig. 4a presents a signalling example for a procedure for directing a short message to a subscriber-specific VPN subscriber number in a case where the transmission of the short message is successful. The A-subscriber has changed the address of the short-message service centre 10 in the address field of his/her terminal device into the address of the service node 8 and sent a short message to a VPN number. The short message is transmitted from the mobile services switching centre 7 serving the A-subscriber to the service node 4 8 in a MAP_FORWARD_SHORT_MESSAGE message, whose title fields contain the following information, which is identified by a MAP object in the service node 8

Parameter	Description	Change
Invoke Id	Identifier of the MAP service primitive	Not to be changed
SM-RP DA	User-defined address of the short-message service centre	To be changed
SM-RP OA	Sender's international subscriber number (MSISDN)	Not to be changed
SM-RP UI	SM-TP DU, data processed by short-message service centre	Certain parameters to be changed

The SM-RP UI (User Information, UI) contains the following information, which is identified by a SM-TP object in the service node 8 from a SM-TP-SMS-SUBMIT message

Abbreviation	Designation	Description	Change
TP-MTI	TP-Message-Type-Indicator	Describes type of message	Not to be changed
TP-VPF	TP-Validity-Period-Format	Indicates whether TP-VP is in use	Not to be changed

TP-RP	TP-Reply-Path	Indicates whether Reply path is used	Not to be changed
TP-SRR	TP-Status-Report-Request	Indicates whether terminal is to be informed of delivery of message	Not to be changed
TP-MR	TP-Message-Reference	Indicates the SMS-SUBMIT message	Not to be changed
TP-DA	TP-Destination Address	Receiver's number (generally MSISDN, now receiver's VPN number	To be changed
TP-PID	TP-Protocol Identifier	Indicates superior protocol	Not to be changed
TP-DCS	TP-Data-Coding-Scheme	TP-UD coding method	Not to be changed
TP-VP	TP-Validity-Period	Indicates how long the short-message service centre keeps the message	Not to be changed Not to be changed
TP-UDL	TP-User-Data-Length	Length of TP-UD	Not to be changed
TP-UD	TP-User-Data	Text by sender of short message	Not to be changed

Based on the SM-RP OA parameter (sender's MSISDN number) of the MAP_FORWARD_SHORT_MESSAGE and the TP-DA parameter (receiver's VPN number) of the SM_TP_SMS_SUBMIT message, the service node 8 makes a database query, the response to which is a new TP-DA parameter (B-subscriber's actual MSISDN number) and the number of the short-message service centre 10.

The service node changes the parameters in such manner that, in the SM-RP DA parameter, the address of the service node 8 is replaced with the address of the short-message service centre 10 and, in the SM-TP DA pa-

rameter, the VPN number is replaced with the MSISDN number. Next, the service node 8 sends the short message to the routing centre 2 in a MAP_FORWARD_SHORT_MESSAGE message.

The routing centre 9 acknowledges receipt of the short message by sending the service node a MAP_FORWARD_SHORT_MESSAGE_ACK message, which is sent by the service node 8 to the mobile services switching centre 7 in the form in which the mobile services switching centre 7 would have received it directly from the routing centre 9, which means changing the GT address of the message. The parameters of the MAP_FORWARD_SHORT_MESSAGE_ACK message are Invoke Id and, in the case of an error, User error, which indicates the cause of the failure.

Fig. 4b presents a signalling example for a procedure for directing a short message to a subscriber-specific VPN subscriber number in a case where a short message has been sent with an ordinary MSISDN number. Based on the TP-DA parameter, the service node 8 identifies the short message as an ordinary short message sent with a MSISDN number. No database query is needed, but the short message can be transmitted directly to a default short-message centre in a MAP_FORWARD_SHORT_MESSAGE message. The service node 8 changes the message parameters in such manner that, in the SM-RP DA parameter, the address of the service node 8 is replaced with the address of the default short-message service centre. Next, the service node 8 transmits in a MAP_FORWARD_SHORT_MESSAGE_ACK message an acknowledgement from the routing centre 9 to the mobile services switching centre 7 which sent the message.

Fig. 4c presents a signalling example for a procedure for directing a short message to a subscriber-specific VPN subscriber number in a case where the subscriber is not found in the service database 11. In this case, the service node 8 receives as a return value from

the database 11 a database error indicating that the subscriber is not found. The service node 8 sends the short message to a default short-message centre in MAP_FORWARD_SHORT_MESSAGE message after changing the message parameters in such manner that, in the SM-RP DA parameter, the address of the service node 8 is replaced with the address of the default short-message service centre.

The present application is based on the earlier Finnish application FI 974384 by the same applicant, said application being included here by this reference.

The invention is not restricted to the examples of its embodiments described above, but many variations are possible within the scope of the inventive idea defined by the claims.

CLAIMS

1. System for directing a short message to a virtual subscriber number in a telecommunication network comprising a mobile communication network, which comprises a short-message service centre (1) for the reception, storage and transmission of short messages, a routing centre (2) for the routing of short messages, a mobile services switching centre (3) serving the B-subscriber, a service database (5) for maintaining subscriber-specific intelligent network service data and a home location register (6) for maintaining subscriber information, characterised in that the system comprises means (4) for establishing the international subscriber number (MSISDN) corresponding to the virtual subscriber number.

2. System as defined in claim 1, characterised in that said means (4) are implemented as a service node separate from the short-message service centre.

3. System as defined in claim 1, characterised in that said means (4) are implemented as a service node in conjunction with the short-message service centre.

4. System as defined in any one of claims 1 - 3, characterised in that

- the home location register (6) and the routing centre (2) are connected to each other via the service node (4) in such manner that the service node (4) is transparent both to the home location register (6) and to the routing centre (2); and
- the service node (4) is connected to an internal or external service database (5).

5. System as defined in any one of claims 1 - 4, characterised in that the routing centre (2) comprises means for performing a GT analysis on the virtual number direction, so that the routing centre is

able to route short messages sent in a given number direction to the service node.

6. System as defined in any one of claims 1 - 5, characterised in that the mobile communication network is GSM compatible.

7. System for directing a short message to a subscriber-specific VPN subscriber number in a telecommunication network comprising a mobile communication network, which comprises a mobile services switching centre (7) serving the A-subscriber, a routing centre (9) for the routing of short messages, a short-message service centre (10) for the reception, storage and transmission of short messages and a service database (11) for maintaining subscriber-specific intelligent network service data, characterised in that the system comprises means (4) for establishing the international subscriber number (MSISDN) corresponding to the subscriber-specific VPN subscriber number.

8. System as defined in claim 7, characterised in that said means (4) are implemented as a service node separate from the short-message service centre.

9. System as defined in claim 7, characterised in that said means (4) are implemented as a service node in conjunction with the short-message service centre.

10. System as defined in any one of claims 7 - 9, characterised in that

- the mobile services switching centre (7) and the routing centre (9) are connected to each other via the service node (8) in such manner that the service node (8) is transparent both to the mobile services switching centre (7) and to the routing centre (9); and
- the service node (8) is connected to an internal or external service database (11).

11. System as defined in any one of claims 7 - 10, characterised in that the mobile services switching centre (7) comprises means for performing a GT analysis on the number of the service node (8), enabling the routing centre to route short messages sent in a given number direction to the service node.

12. System as defined in any one of claims 7 - 11, characterised in that the mobile communication network is GSM compatible.

13. Procedure for directing a short message to a virtual subscriber number in a telecommunication network comprising a mobile communication network, which comprises a short-message service centre (1) for the reception, storage and transmission of short messages, a routing centre (2) for the routing of short messages, a mobile services switching centre (3) serving the B-subscriber, a service database (5) for maintaining subscriber-specific intelligent network service data and a home location register (6) for maintaining subscriber information, characterised in that a service node (4) is connected to the telecommunication network to establish the international subscriber number (MSISDN) corresponding to the virtual subscriber number, and that the procedure comprises the steps of

- sending from the routing centre (2) to the service node (4) a routing inquiry containing the B-subscriber's virtual subscriber number as a parameter;
- sending from the service node (4) to the home location register (6) a service inquiry containing the B-subscriber's international subscriber number (MSISDN) as a parameter;
- sending from the home location register (6) to the service node (4) the B-subscriber's subscriber identity code (IMSI) and the address of the mobile services switching centre (3) serving the B-subscriber;

- transmitting from the service node (4) to the routing centre (2) the B-subscriber's subscriber identity code (IMSI) and the address of the mobile services switching centre (3) serving the B-subscriber;

- transmitting the short message from the routing centre (2) to the mobile services switching centre (3) serving the B-subscriber, which transmits the short message to the B-subscriber.

14. Procedure as defined in claim 13, characterised in that

- a service inquiry containing the B-subscriber's virtual subscriber number as a parameter is sent from the service node (4) to the service database (5); and

- the B-subscriber's international subscriber number (MSISDN) is sent from the service database (5) to the service node (4).

15. Procedure as defined in claims 13 - 14, characterised in that an acknowledgement of receipt of the short message is sent from the mobile services switching centre (3) serving the B-subscriber to the routing centre (2).

16. Procedure as defined in claims 13 - 15, characterised in that a message indicating successful/unsuccessful transfer of the short message is sent from the routing centre (2) to the service node (4) and transmitted further to the home location register (6).

17. Procedure as defined in claims 13 - 16, characterised in that an acknowledgement of the message is sent from the home location register (6) to the service node (4), said acknowledgement being transmitted further to the routing centre (2) after the general title (GT) has been converted in the service node (4) into the address of the routing centre (2).

18. Procedure as defined in any one of claims 13 - 17, characterised in that, if no interna-

tional subscriber number (MSISDN) corresponding to the virtual subscriber number can be found in the service database (5), then an error message is sent from the service node (4) to the routing centre (2).

19. Procedure as defined in claims 13 - 18, characterised in that an error message received from the home location register (6) is transmitted from the service node (4) to the routing centre (2) and the routing centre's (2) acknowledgement of the error message is transmitted to the home location register (6) if a service inquiry sent from the service node (4) to the home location register (6) is unsuccessful.

20. Procedure as defined in any one of claims 13 - 19, characterised in that the communication between the service node (4) and the home location register (6) and between the service node (4) and the routing centre (2) is accomplished using standard MAP protocols.

21. Procedure as defined in any one of claims 13 - 20, characterised in that the communication between the service node (4) and the external database (5) is accomplished using database queries of standard intelligent network protocols, such as ETSI CoreINAP, ITU-T CS1 and/or X.500.

22. Procedure as defined in any one of claims 13 - 21, characterised in that the mobile communication network is GSM compatible.

23. Procedure for directing a short message to a subscriber-specific VPN subscriber number in a telecommunication network comprising a mobile communication network, which comprises a mobile services switching centre (7) serving the A-subscriber, a routing centre (9) for the routing of short messages, a short-message service centre (10) for the reception, storage and transmission of short messages and a service database (11) for maintaining subscriber-specific intelligent

network service data, characterised in that a service node (8) is connected to the telecommunication network to establish the international subscriber number (MSISDN) corresponding to the subscriber-specific VPN subscriber number, and that the procedure comprises the steps of

- transmitting the short message, which is addressed to a subscriber-specific VPN subscriber number and in which the A-subscriber has replaced the address of the short-message service centre (10) with the address of the service node (8) by manual operation via his/her terminal device, from the mobile services switching centre (7) to the service node (8);

- sending from the service node (8) to the service database (11) a service inquiry containing the A-subscriber's international subscriber number (MSISDN) and the B-subscriber's subscriber-specific VPN subscriber number as parameters;

- sending the B-subscriber's international subscriber number (MSISDN) from the service database (11) to the service node (8);

- changing the title field parameters of the short message in the service node (8) in such manner that the B-subscriber's subscriber-specific VPN subscriber number is replaced with the B-subscriber's international subscriber number (MSISDN) and the address of the service node (8) is replaced with the address of the short-message service centre (10); and

- transmitting the short message from the service node (8) to the routing centre (9).

24. Procedure as defined in claim 23, characterised in that an acknowledgement of receipt of the short message is sent from the routing centre (9) to the service node (8), said acknowledgement being transmitted further to the mobile services switching centre (7) after the general title (GT) has been con-

verted in the service node (8) into the address of the mobile services switching centre (7).

25. Procedure as defined in claim 23 or 24, characterised in that the title field parameters of the short message are changed in the service node (8) in such manner that the address of the service node (8) is replaced with the address of a default short-message service centre, whereupon the short message is transmitted from the service node (8) to the routing centre (9), whereupon an acknowledgement is sent from the routing centre (9) to the service node (8), which acknowledgement is transmitted to the mobile services switching centre (7) if the B-subscriber's international subscriber number (MSISDN) is not found in the service database (11).

26. Procedure as defined in any one of claims 23 - 25, characterised in that the address field parameters of the short message are changed in the service node (8) in such manner that the address of the service node (8) is replaced with the address of a default short-message service centre, whereupon the message is transmitted from the service node (8) to the routing centre (9), whereupon an acknowledgement is sent from the routing centre (9) to the service node (8), which acknowledgement is transmitted to the mobile services switching centre (7) if a message addressed to an international subscriber number (MSISDN) has been sent to the service node (8).

27. Procedure as defined in claims 23 - 26, characterised in that the communication between the service node (8) and the mobile services switching centre (7) and between the service node (8) and the routing centre (9) is accomplished using standard MAP, SM-TP and SM-RP protocols.

28. Procedure as defined in any one of claims 23 - 27, characterised in that the communication

between the service node (8) and the external database (11) is accomplished using database queries of standard intelligent network protocols, such as ETSI CoreINAP, ITU-T CS1 and/or X.500.

29. Procedure as defined in any one of claims 23 - 28, characterised in that the mobile communication network is GSM compatible.

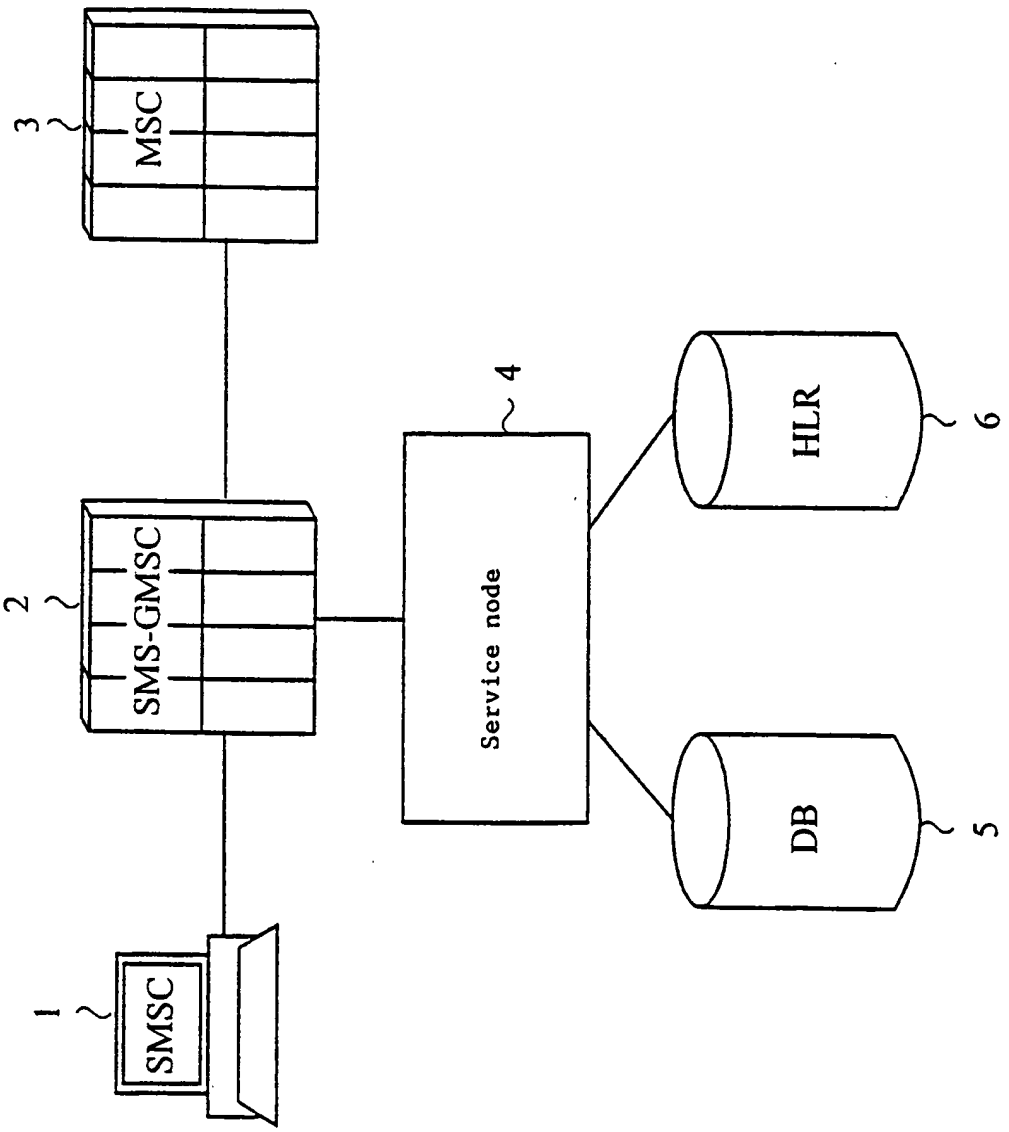

Fig. 1

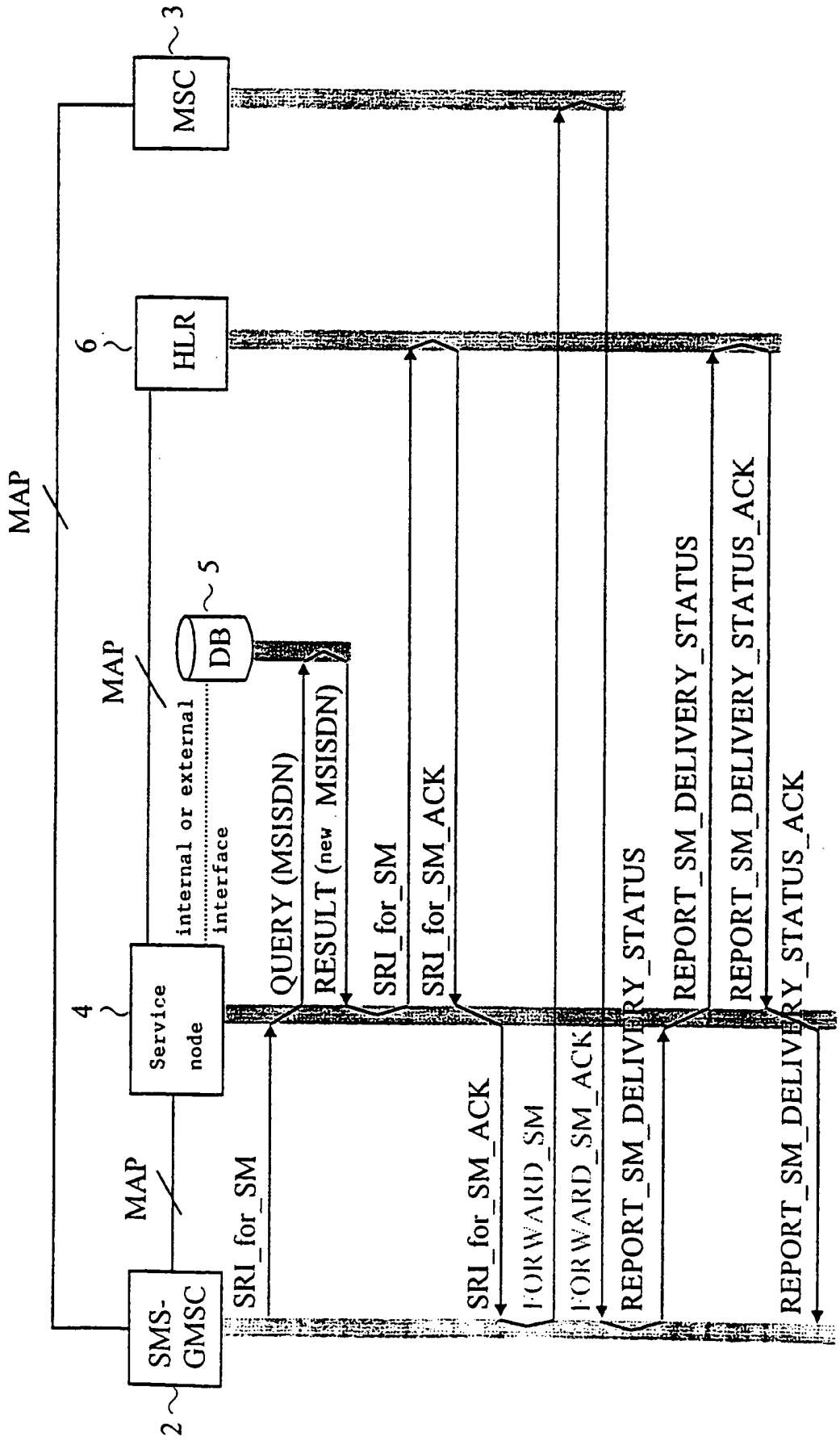
MSC
3
HLR
6
MAP
DB
5
MAP
internal or external interface
Service node
4
MAP
SMS-GMSC
2
SRI_for_SM
QUERY (MSISDN)
RESULT (new MSISDN)
SRI_for_SM
SRI_for_SM_ACK
SRI_for_SM_ACK
FORWARD_SM
FORWARD_SM_ACK
REPORT_SM_DELIVERY_STATUS
REPORT_SM_DELIVERY_STATUS
REPORT_SM_DELIVERY_STATUS_ACK
REPORT_SM_DELIVERY_STATUS_ACK

Fig. 2a

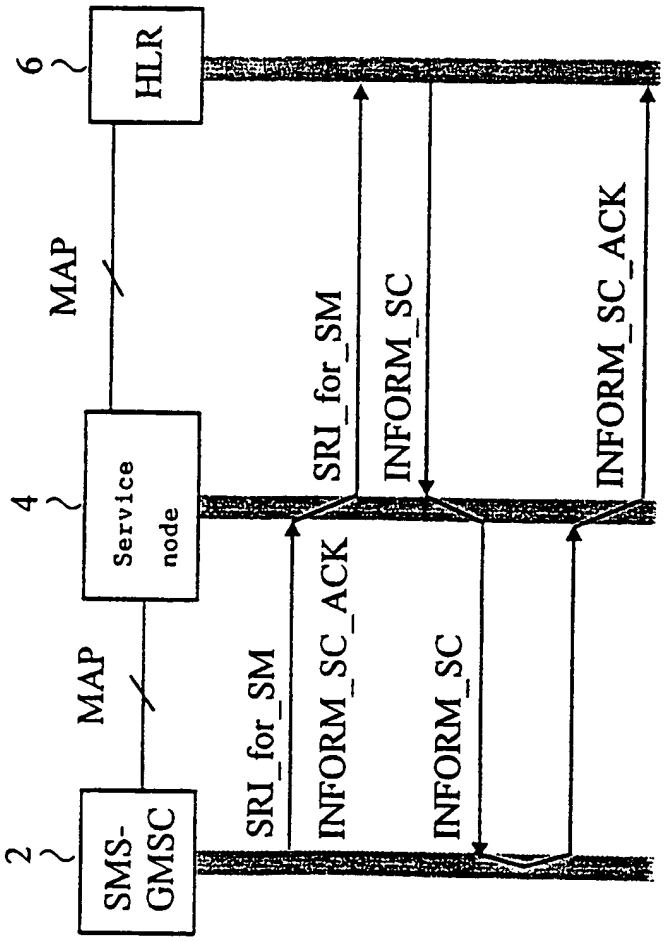
6
HLR
MAP
4
Service node
MAP
2
SMS-GMSC
SRI_for_SM
INFORM_SC_ACK
SRI_for_SM
INFORM_SC
INFORM_SC
INFORM_SC_ACK

Fig. 2b

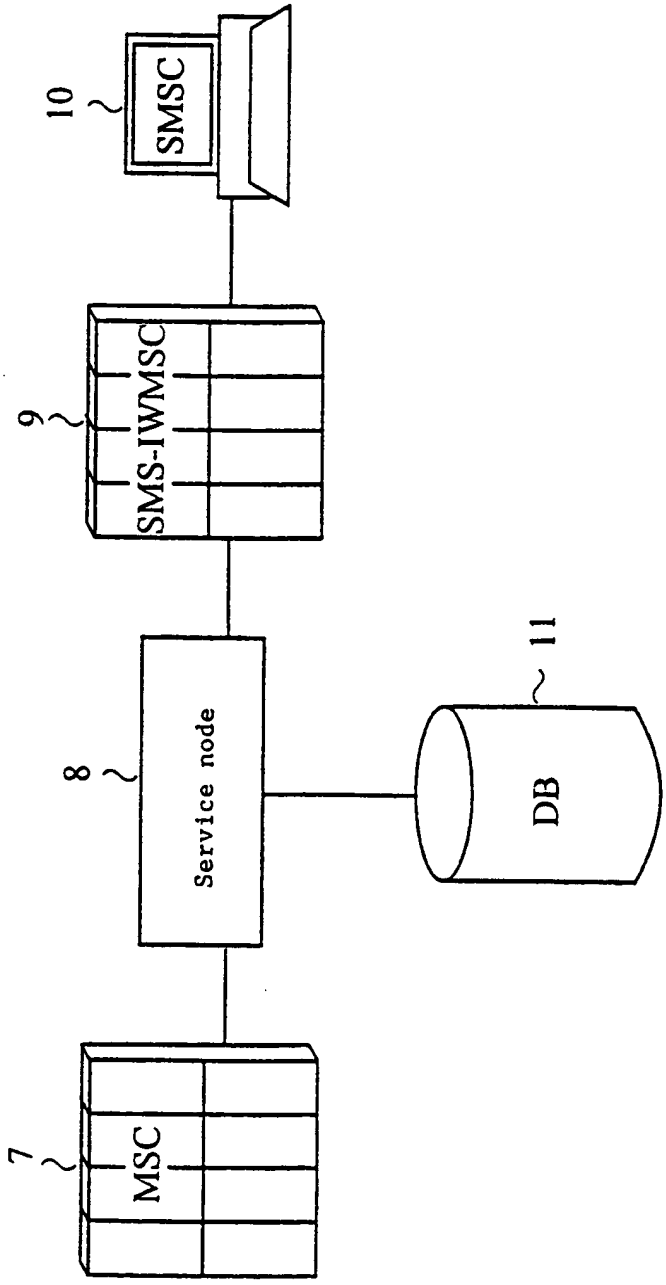

Fig. 3

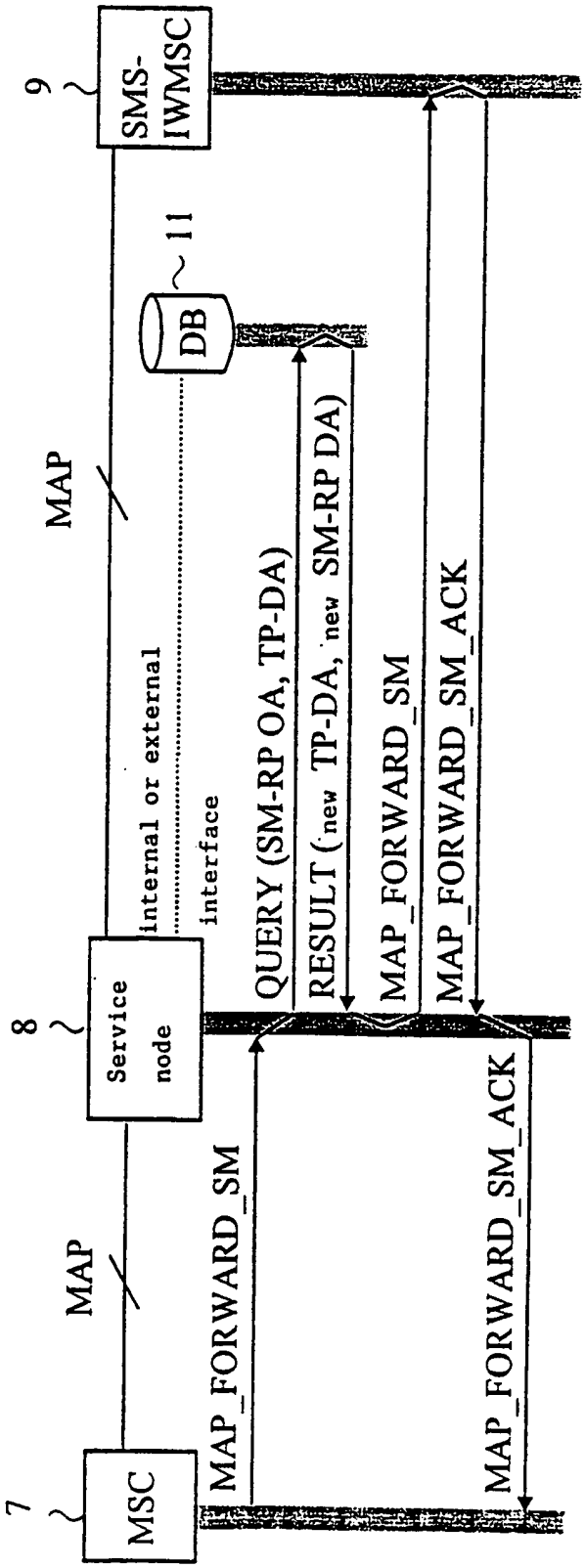
9
SMS-IWMSC
11
DB
MAP
internal or external interface
QUERY (SM-RP OA, TP-DA)
RESULT (new TP-DA, new SM-RP DA)
MAP_FORWARD_SM
MAP_FORWARD_SM_ACK
8
Service node
MAP
MAP_FORWARD_SM
MAP_FORWARD_SM_ACK
7
MSC

Fig. 4a

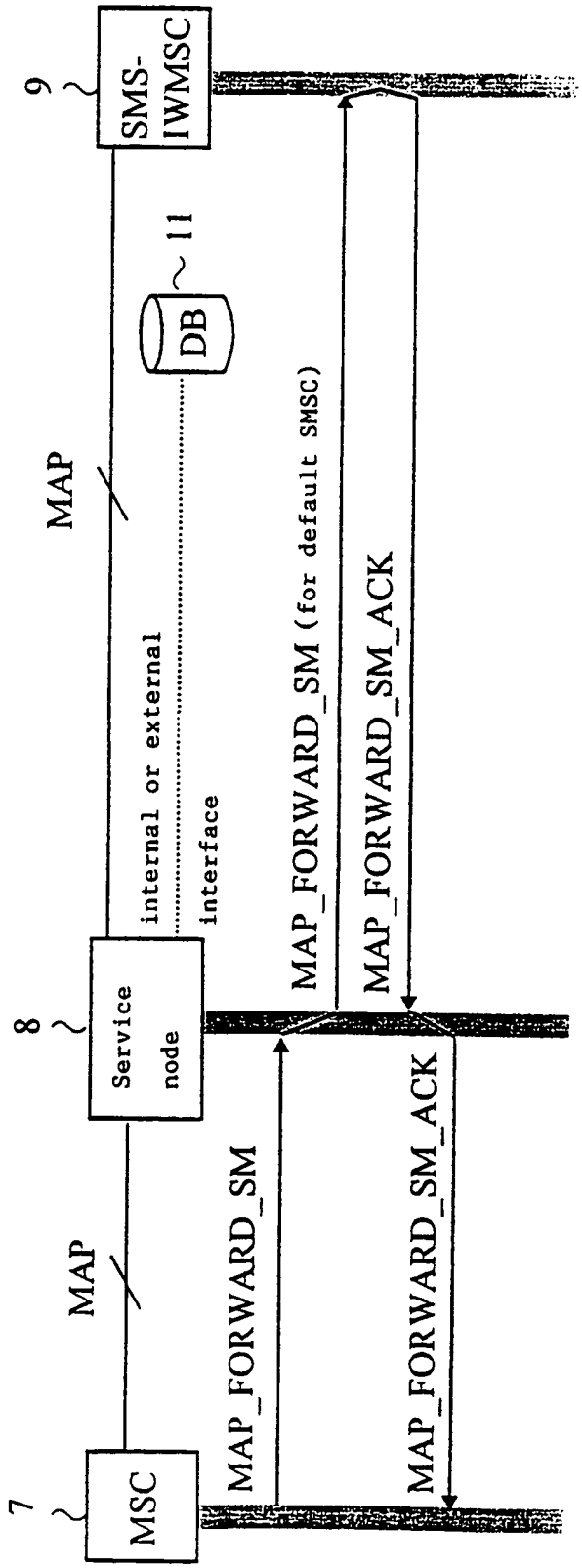
9
SMS-IWMSC
11
DB
MAP
internal or external interface
MAP_FORWARD_SM (for default SMSC)
MAP_FORWARD_SM_ACK
8
Service node
MAP
MAP_FORWARD_SM
MAP_FORWARD_SM_ACK
7
MSC

Fig. 4b

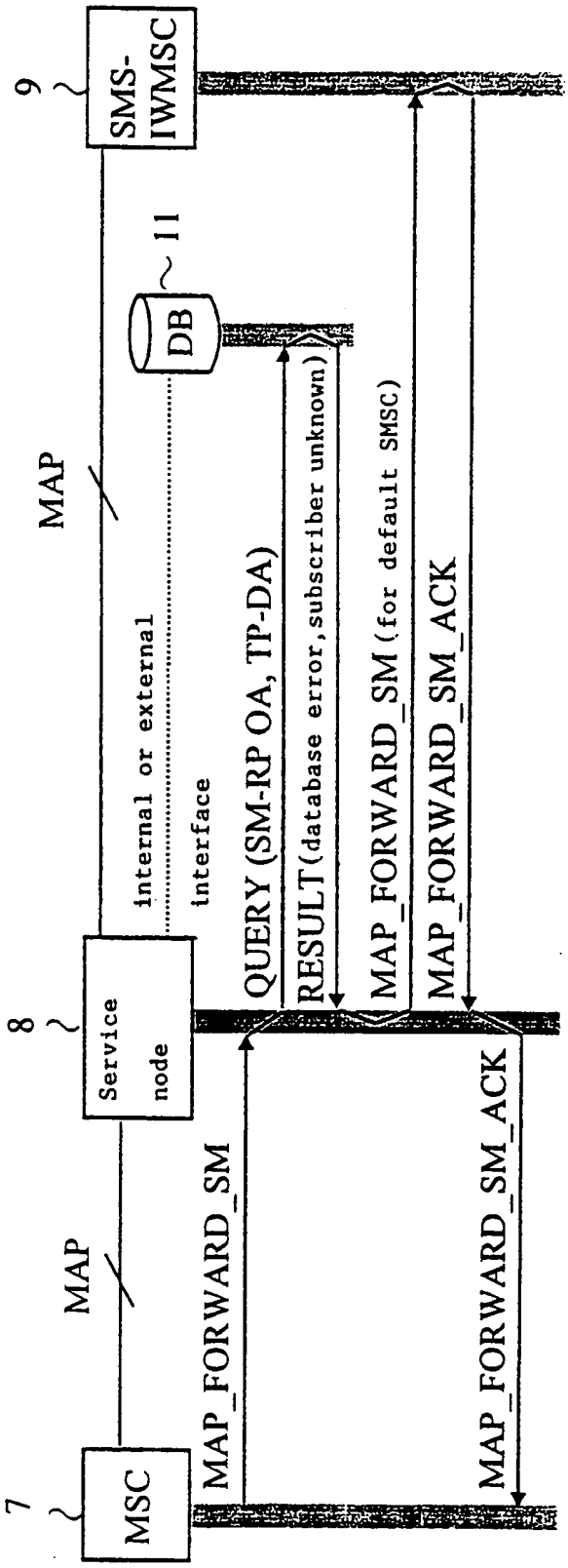
SMS-IWMSC
9
DB
11
MAP
internal or external interface
Service node
8
QUERY (SM-RP OA, TP-DA)
RESULT(database error,subscriber unknown)
MAP_FORWARD_SM(for default SMSC)
MAP_FORWARD_SM_ACK
MAP
MAP_FORWARD_SM
MAP_FORWARD_SM_ACK
MSC
7

Fig. 4c